

101500443

DT04 Rec'd PCT/PTO 29 JUN 2004

APPLICATION  
FOR  
UNITED STATES LETTERS PATENT

TITLE: A DENTAL IMPLANT SYSTEM

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CERTIFICATE OF MAILING BY EXPRESS MAIL

Express Mail Label No. EV 382042056 US

June 29, 2004

Date of Deposit

7/PRTS

101500443  
DT04 Rec'd PCT/PTO 29 JUN 2004~

## A DENTAL IMPLANT SYSTEM

### BACKGROUND OF THE INVENTION

#### Field of the invention

5       The present invention relates to a dental implant system, and in particular to an improved dental implant system which is capable of enhancing a strength of a dental implant by improving an assembling structure of an implant root planted in an alveolar bone, an abutment assembled to the implant root and a crown covering the surface of the abutment, and implementing an easier 10 dental operation, so that it is possible to increase a selectable range of operation based on the condition of patient's teeth.

#### Description of Related Art

In the dental implant system, an implant root is inserted into an alveolar 15 bone and is combined to a bone. Thereafter, an abutment adapted to support the implant is engaged to the implant root. A crown is covered onto the abutment. According to the above implant system, it is possible to independently plant one tooth. In addition, since the thusly planted implant has a certain supporting force, it is unnecessary to cut a natural tooth due to the 20 damaged tooth or drawn-out tooth. In other cases, it is possible to stably

support a denture. In addition, the life span of the same is long, and a physical appearance of the teeth is good. There are many advantages.

In detail, the implant may be classified into a screw type and a non-screw type.

5       Figure 1 is a view illustrating a screw type system which is first introduced and is most widely used and has the US patents Nos. 4,330,891, 4,763,788, 4,824,372, 5,064,375, 5,064,425, 5,069,622, 5,080,589, 5,098,293, 5,125,841, 5,145,371, 5,154,612, and 5,269,685.

As shown therein, the screw type implant includes an implant root I 10 which has a self-tapped screw I1 in an outer circumference of the same and is inserted into and combined with an alveolar bone S, an abutment A which is fixed to the implant root I by an abutment screw A1 screwed to an inner circumference of the same, and a crown engagement member E which is engaged to the abutment A by a fixing screw A2 of the crown.

15       Here, reference character A0 represents an auxiliary screw which seals a screw hole of the implant root I until the implant root I is combined with the alveolar bone S and helps a bone combination of the implant root in the alveolar bone and prevents an insertion of a debris of food. A dotted line represents a crown C processed and installed, after the alveolar bone and the operated 20 portions are healed up.

The above screw type implant system needs lots of parts, so that the fabrication and maintenance costs are expensive, and an operation is complicated. Therefore, a complication may be developed. In addition, the medical care insurance rate of the patient may be increased.

5       In particular, the above system is implemented based on an engaging force of the screws A1 and A2 between the parts, the maximum external force such as a uniting force, etc. is determined based on the size of the width of the screw thread and the width and length of the implant. Therefore, the supporting force is small. In case that the supporting force is not bearable, the screws may  
10      be loosened.

In addition, the dental implant system in the screw type may be resistant to the compressing force when a uniting function is performed in the mouth. However, when the tension force is increased, the screws may be loosened during the use of the implant.

15       In addition, a certain gap between the implant root and abutment is formed by a poor interconnection between the implant root and abutment, whereby a certain bacteria may invade thereto to cause a sanitation problem and an inflammation in a surrounding tissue, so that an alveolar bone may be absorbed.

20       Figure 2 is a view illustrating the dental implant system of the non-screw

type which is invented to overcome the problems of the screw type implant system. As shown therein, there is provided a locking taper method which is implemented based on a surface friction force with respect to the engagement between parts.

5       The constitution of Figure 2 is a representative in the locking taper method which is commercially available of "Bicon".

In the constitution of the above system, a well I2 having the tapered surfaces which are expanded in an upper direction is formed in the interior of the implant I inserted into the alveolar bone S, and a post portion A3 having a 10 certain taper corresponding thereto is extended in a lower portion of the abutment A. Namely, the abutment A is engaged to the implant I based on a surface friction force between the well I2 and the post portion A3.

An expanding flare portion A4 is provided in an upper portion of the abutment A, and both sides of the same are cut into provide a conical head 15 forming a slanted surface A5.

In the above conventional dental implant system, the engaging operation with respect to the alveolar bone S is implemented by the dental implant system I, and the abutment A supporting the crown C is engaged to the implant root I.

20       However, since an external force such as a uniting force is applied to

the abutment A through the crown C, the strength of the above system is determined based an engaging force between the abutment A and implant root I and the strength of the implant root I itself.

When compared with the screw type of Figure 1 in which the  
5 engagement is implemented based on the screw treads of screws A1 and A2 which have relatively smaller diameters, the locking taper method of Figure 2 has much higher engaging forces, and it has a screw loosening problem. However, since the maximum strength is determined based on the minimum diameter of the engaging part, there is a big problem in that point.

10           Namely, when assembling the implant root I to the abutment A, the post portion A3 of the abutment A is inserted into the well I2 formed in the center of the implant root I. Therefore, the size "a" of the neck portion of the post portion A3 and the size "b" of the surrounding portion of the implant root I which size is obtained by subtracting the size of the neck portion are too small as shown in  
15           Figure 3.

Therefore, a breaking problem may occur in case of the teeth requiring a larger uniting force such as back tooth,. The above problem may be most critical to the conventional implant system. So, it is most needed to overcome the above problem.

20           In particular, after being implanted, the minimum diameter of the

surrounding cave of the implant is preferably about 2.0mm. Therefore, in case of the constitution in Figure 2, the minimum diameter should be 7.5mm. The relatively small portion needs a small implant. The size of the neck portion of the post portion of Figure 2 should be over 2.0mm not to be easily broken. In 5 the above conventional method, the actual use of the implant is limited due to the impossibility to decrease the size of the implant. In addition, if the size of the implant is much smaller, the implant may be easily broken. Therefore, there are many problems for actually using the same.

In the conventional implant of Figures 1 trough 3, the upper portion and 10 lower portion of the implant root may not be formed at a certain angle therebetween.

Namely, when planting the implant root into the alveolar bone, it may be necessary to avoid an anatomical structure(cortex which forms a lower alveolar pipe, biperforate, and maxillary sinus) of a maxilla or mandible under a certain 15 circumstance. In order to avoid the above anatomical structure, an implant root bent at a certain angle is necessary. However, since the conventional implant root has a well in the center of the same, it is impossible to form a bent type implant.

Accordingly, the present invention provides a dental implant system in order to overcomes the problems encountered in the conventional art.

It is an object of the present invention to provide a dental implant system which is capable of forming a post portion in an implant root and a well 5 in an abutment as the locking taper method instead of a conventional art in which a well is formed in an implant root and a post portion is formed in an abutment, so that when engaging the same, it is possible to implement a stable engagement, fabricate a smaller size of the implant root, and plant the implant with avoiding an anatomical structure in the mouth.

10 To achieve the above object, In a dental implant system which includes an implant root 10 planted in an alveolar bone, an abutment 20 assembled to the implant root, and a crown 30 assembled to the abutment, the dental implant system in which:

the implant root 10 is formed in a cylindrical shape without a longitudinal 15 well in the interior of the same, and comprises a circular rim groove 13 formed along an outer circumferential surface of an upper portion of the same, a post portion 11 having a first taper portion 14 and a second taper portion 15 below the circular rim groove 13, and a planting portion 12 and multiple protruded circular plate pins 12 below the post portion 11 ; and

20 the abutment 20 is formed in a cylindrical shape having an expanded

portion 21 curved at middle of the same, and comprises a well 23 including a taper inner diameter portion 22 in the lower surface of the same, so that the post portion 11 of the implant 10 is inserted into the well 23, a crown engaging portion 25 including the expanded portion 21 in the upper side, and an engaging well 5 24 in an upper surface of the engaging portion; and

the crown 30 is engaged to an upper side of the abutment and comprises an abutment post 31 corresponding to the engaging well 24 at a center portion of the interior of the crown.

10

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become better understood with reference to the accompanying drawings which are given only by way of illustration and thus are not limitative of the present invention, wherein;

15 Figure 1 is a cross-sectional view illustrating an example of an assembled state of a conventional dental implant system;

Figure 2 is a cross-sectional view illustrating another example of an assembled state of a conventional tooth implant system;

Figure 3 is a disassembled cross-sectional view of Figure 2;

20 Figure 4 is a cross-sectional view illustrating an assembled state of a dental implant system according to the present invention;

Figure 5 is a cross-sectional view illustrating a disassembled state of a dental implant system according to the present invention;

Figure 6 is a view illustrating another embodiment of an implant according to the present invention; and

5       Figure 7 is a view illustrating another embodiment of an abutment according to the present invention.

\* Descriptions of the major elements in the drawings \*

10      10: implant root

10      20: abutment

30: crown

**DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS**

The preferred embodiments of the present invention will be described  
15      with reference to the accompanying drawings.

Figure 4 is a cross-sectional view illustrating an assembled state of an implant system according to the present invention, and Figure 5 is a view illustrating a disassembled state of an implant according to the present invention.

20      As shown therein, the implant according to the present invention includes

an implant root 10 and an abutment 20.

In a dental implant system which includes an implant root 10 planted in an alveolar bone, an abutment 20 assembled to the implant root, and a crown 30 assembled to the abutment, the dental implant system in which:

- 5           the implant root 10 is formed in a cylindrical shape without a longitudinal well in the interior of the same, and comprises a circular rim groove 13 formed along an outer circumferential surface of an upper portion of the same, a post portion 11 having a first taper portion 14 and a second taper portion 15 below the circular rim groove 13, and a planting portion 12 and multiple protruded  
10          circular plate pins 12 below the post portion 11 ; and

- the abutment 20 is formed in a cylindrical shape having an expanded portion 21 curved at middle of the same, and comprises a well 23 including a taper inner diameter portion 22 in the lower surface of the same, so that the post portion 11 of the implant 10 is inserted into the well 23, a crown engaging portion  
15          25 including the expanded portion 21 in the upper side, and an engaging well 24 in an upper surface of the engaging portion 21.

Figure 5 is a view illustrating an embodiment of the implant root 10 according to the present invention.

As shown in Figure 5, in the implant root 10, the minimum diameter of  
20          the upper most portion of the post portion 11 is about 2mm, and the height of

the same is about 3.5mm, and in the planting portion 12, the maximum diameter of the upper most circular plate pin 16 is about 4mm, the height of the same is about 8mm, and the call size of the same is 4\*8.

There are about 7~8 call sizes from the relatively smaller sizes to the  
5 bigger sizes.

The circular rim groove 13 of the post portion 11 is formed in a portion lower from the upper surface by 0.5mm, and has a width of about 0.3mm and a depth of about 0.3mm.

The circular rim groove 13 is adapted to prevent any escape of the  
10 implant due to a certain friction force when the abutment 20 is assembled.

The first taper portion 14 of the post portion 11 has a slant of about 1.5°.  
Namely, the diameter of the upper most portion in which the circular rim groove  
13 is formed has the smallest size, and the size of the same is gradually  
increased toward the lower direction. When the minimum size of the upper  
15 most portion is about 2mm, the diameter just before the second taper portion 15  
is about 2.183mm.

The second taper portion 15 has about 0.5mm height from the first taper portion, and has a slant of about 3°, so that it is possible to implement a tight insertion when it is inserted into the well 23 of the abutment.

20 There are provided seven circular plate pins 16 of the planting portion 12.

The first circular plate pin 16a of the upper most portion has a height of 1.3mm, and a diameter of 4mm, and the distance from the next second circular plate pin 16b to the seventh circular plate pin 16g is 1.1mm.

In addition, the maximum diameters from the first circular plate pin 16a to the fourth circular plate pin 16d are same, and the diameters are gradually decreased in the directions of the fifth circular plate pin 16e through the seventh circular plate pin 16g in order for the teeth to have a natural physical appearance. The diameter of the seventh circular plate pin 16 of the lower most portion is about 3mm.

10        The upper surface of the first circular plate pin 16a has a slant surface of about 45° in an opened umbrella shape, and the second circular plate pin 16b through the seventh circular plate pin 16g also have the opened umbrella shapes, and the upper surfaces of the same have a slant surface of about 20°.

15        In addition, a protrusion 17 is formed in a lower surface of the seventh circular plate pin 16g of the lower most portion. The protrusion 17 is adapted to eliminate an unnecessary alveolar bone removing work by coinciding an end blade portion of a reamer used for forming a well in the alveolar bone for the implant with the protrusion 17.

20        It is important to fabricate the implant root 10 according to the present invention in such a manner that the post portion 11 is slanted at a certain angle

from the planting portion 12(in the conventional art, it is impossible to fabricate the implant bent at a certain angle due to a certain well in the interior of the same).

The physical appearances of the post portion 11 and the planting portion 12 are the same as the above earlier embodiment of the present invention. As shown in Figure 6, the post portion 11 is preferably slanted at about  $10^\circ \sim 20^\circ$  with respect to the planting portion 12.

In this case, even when the planting portion 12 is planted in a slanted state, the post portion 11 maintains a vertical state by avoiding the cortex bone formed of a lower alveolar pipe, biperforate, and maxilla in the major anatomical structure.

In addition, Figure 5 is a view illustrating an embodiment of the abutment 20 according to the present invention, and there may be many abutments having different sizes and other physical appearances.

The abutment 20 is formed in a cylindrical shape having an expanded portion 21 curved at middle of the same, and comprises a well 23 including a taper inner diameter potion 22 in the lower surface of the same, so that the post portion 11 of the implant 10 is inserted into the well 23, a crown engaging potion 25 including the expanded portion 21 in the upper side, and an engaging well 24 in an upper surface of the engaging portion.

The taper angle of the inner diameter portion 22 into which the post portion 11 is inserted has an angle of about 1.5° in order for the abutment 20 to be used for the implant root 10.

The crown is engaged to the upper portion of the expanding portion 21,  
5 and an inner circumferential diameter portion of the well 23 is surface-  
processed for preventing any acid corrosion.

Therefore, when being engaged with the post portion of the implant, the lower most portion of the abutment is connected to the inner portion of the alveolar bone together with the post portion of the implant, so that it is possible  
10 to implement the maximum bone engagement thereby preventing an absorption of the alveolar bone.

When the well 23 formed in the lower portion of the abutment 20 is engaged with the post portion 11 of the implant root 10, the minimum diameter is the diameter of the lower portion of the abutment. Since this diameter is  
15 larger than that of the conventional abutment, it is possible to implement a better physical appearance when covering the crown..

For example, since in recovery of the front tooth portion of the maxilla, the thickness of the lower portion of the exposed portion in a natural tooth is more than about 7.0mm, it is preferred that the thickness of the tooth diameter  
20 portions of the crown must be similar to the thickness of the lower portion of the

exposed portion of the natural teeth after connecting the lower and upper implants in order to adapt a natural tooth shape. In the abutment according to the present invention, it is possible to implement a certain tooth diameter portion very similar to the natural teeth since the lower portion of the abutment is thicker than that of the conventional abutment.

Figure 7 is a view illustrating the abutment 20 according to the present invention.

As shown therein, an engaging well 24 is formed in an upper surface of the crown engaging portion 25 thereby implementing an easier engagement of the crown 30.

At this time, since the engaging well 24 is engaged according to the locking taper method, it is preferred to form a taper in the inner diameter portion having a slant of about 1.5°.

The post portion 31 of the abutment inserted into the engaging well 24 is adapted to engage the Resin crown for a path and synthetic resin of the crown. It is possible to prevent any escape of the crown based on the engaging well 24 without using a permanent cement. Therefore, in the present invention does not need to use a dental cement.

As described above, in the present invention, the post portion having the first taper portion and second taper portion is formed in the upper portion of the

implant root compared to the conventional art in which the well is formed in the implant root, and the post portion is formed in the abutment. In addition, a well having a tapered inner diameter portion is formed in the lower surface of the abutment and implements a stable assembled state thereby providing an

5 excellent support strength, decreasing the minimum diameter of the implant root, and bending the post portion at a certain angle with respect to the planting portion.

Since the abutment is assembled in such a manner that the outer diameter portion of the post portion is surrounded, the thickness of the tooth

10 diameter portion is large, so that it is possible to implement a certain tooth diameter portion which is the same as the tooth diameter portion of the natural teeth. Furthermore, since an engaging well according to the locking taper method is provided for the engagement of the crown in the upper portion, it is possible to implement an easier assembling of the crown. Also, the present

15 invention does not need to use the dental cement.

As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described examples are not limited by any of the details of the foregoing description, unless otherwise specified, but rather

20 should be construed broadly within its spirit and scope as defined in the

appended claims, and therefore all changes and modifications that fall within the meets and bounds of the claims, or equivalences of such meets and bounds are therefore intended to be embraced by the appended claims.

**What is claimed is:**

1. In a dental implant system which includes an implant root planted in an alveolar bone, an abutment assembled to the implant root, and a crown assembled to the abutment, the dental implant system in which:

5           the implant root is formed in a cylindrical shape without a longitudinal well in the interior of the same, and comprises a circular rim groove formed along an outer circumferential surface of an upper portion of the same, a post portion having a first taper portion and a second taper portion below the circular rim groove, and a planting portion and multiple protruded circular plate pins  
10          below the post portion; and

              the abutment is formed in a cylindrical shape having an expanded portion curved at middle of the same, and comprises a well including a taper inner diameter potion in the lower surface of the same, so that the post portion of the implant is inserted into the well, a crown engaging potion including the  
15          expanded portion in the upper side, and an engaging well in an upper surface of the engaging portion; and

              the crown is engaged to an upper side of the abutment and comprises an abutment post corresponding to the engaging well at a center portion of the interior of the crown.

2. The dental implant system of claim 1, wherein the first taper portion of the implant root and the taper inner diameter portion of the abutment have a taper having an angle of about  $0.5^\circ \sim 2.5^\circ$  with respect to a center line of the cylindrical shape.

5

3. The dental implant system of claim 1, wherein the center portion in the said post portion of the implant root is formed at an angle of about  $10^\circ \sim 20^\circ$  with respect to the center of the planting portion.

10 4. The dental implant system of claim 1, wherein the abutment includes an engaging well which engages the abutment post of the crown in the upper surface of the same.

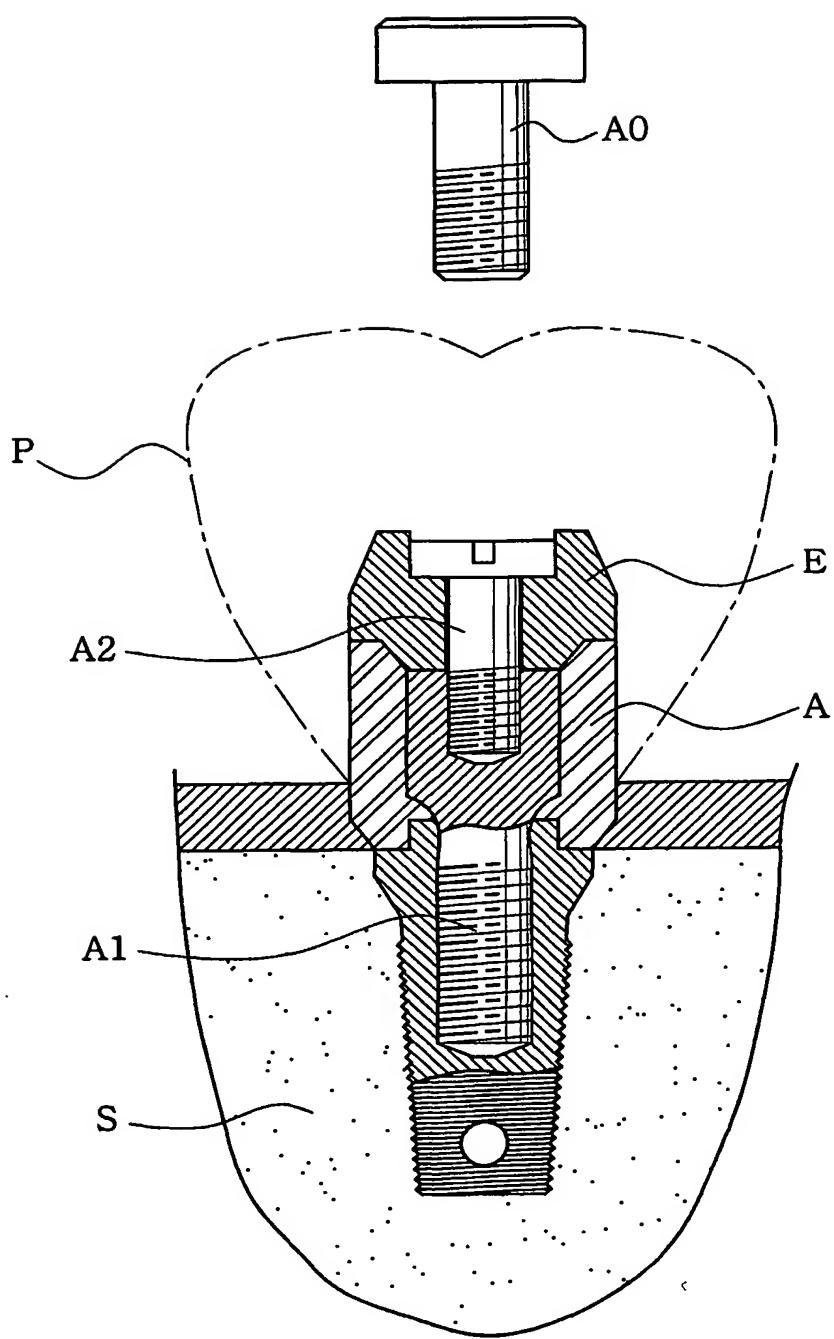
15 5. The dental implant system of claim 4, wherein the engaging well of the abutment and the outer circumferential surface of the abutment post have a taper of an angle of about  $0.5^\circ \sim 2.5^\circ$  with respect to the center line of the cylindrical shape.

**ABSTRACT**

The present invention relates to an implant system for teeth, and in particular to an improved implant system for teeth which is capable of enhancing strength of an implant tooth by improving an assembling structure of an implant planted in an alveolar bone, an abutment assembled to the implant and a crown covering the surface of the abutment, and implementing an easier dental operation, so that it is possible to increase a selectable range of operation based on the condition of patient's teeth.

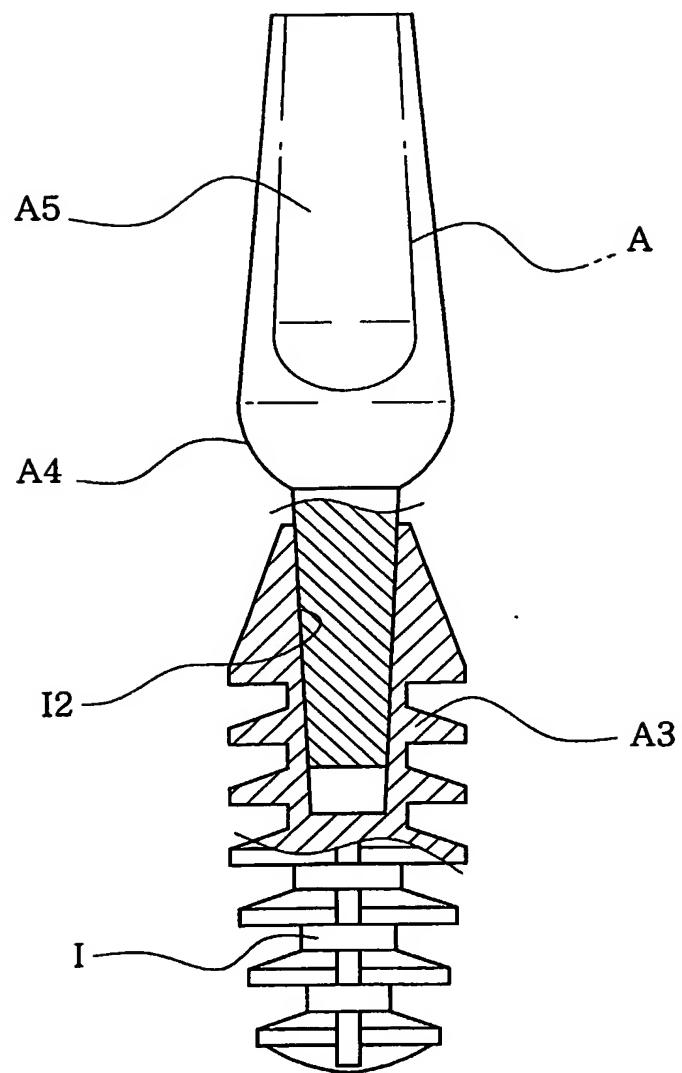
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FIG. 1



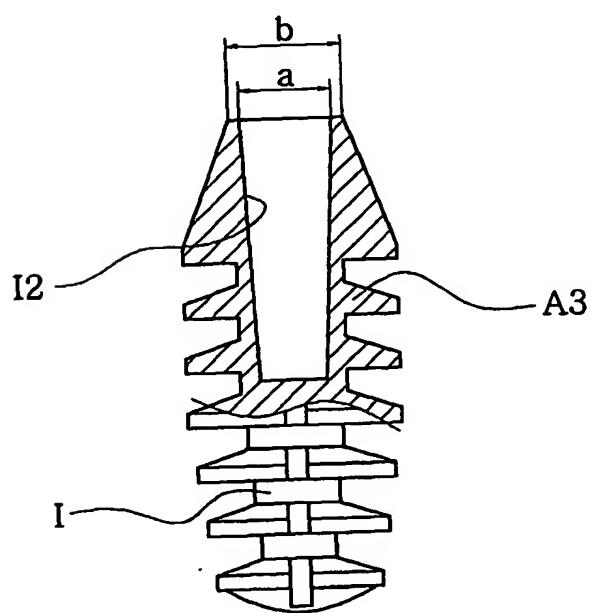
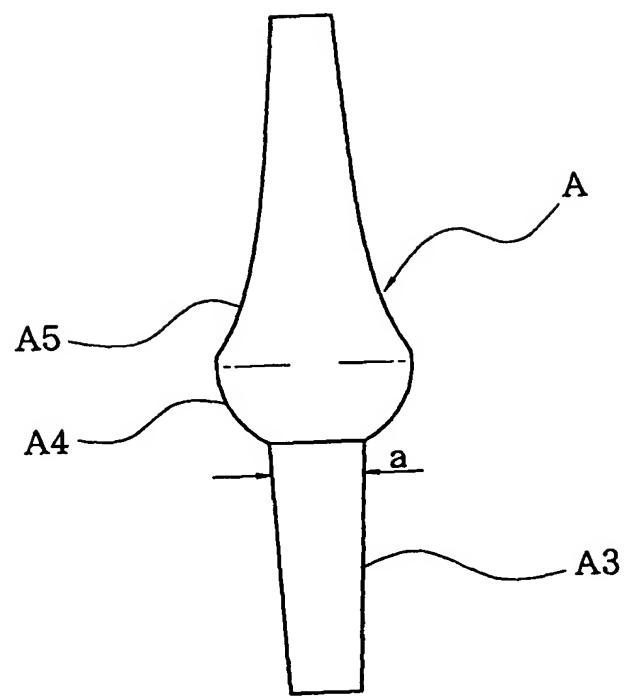
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FIG. 2



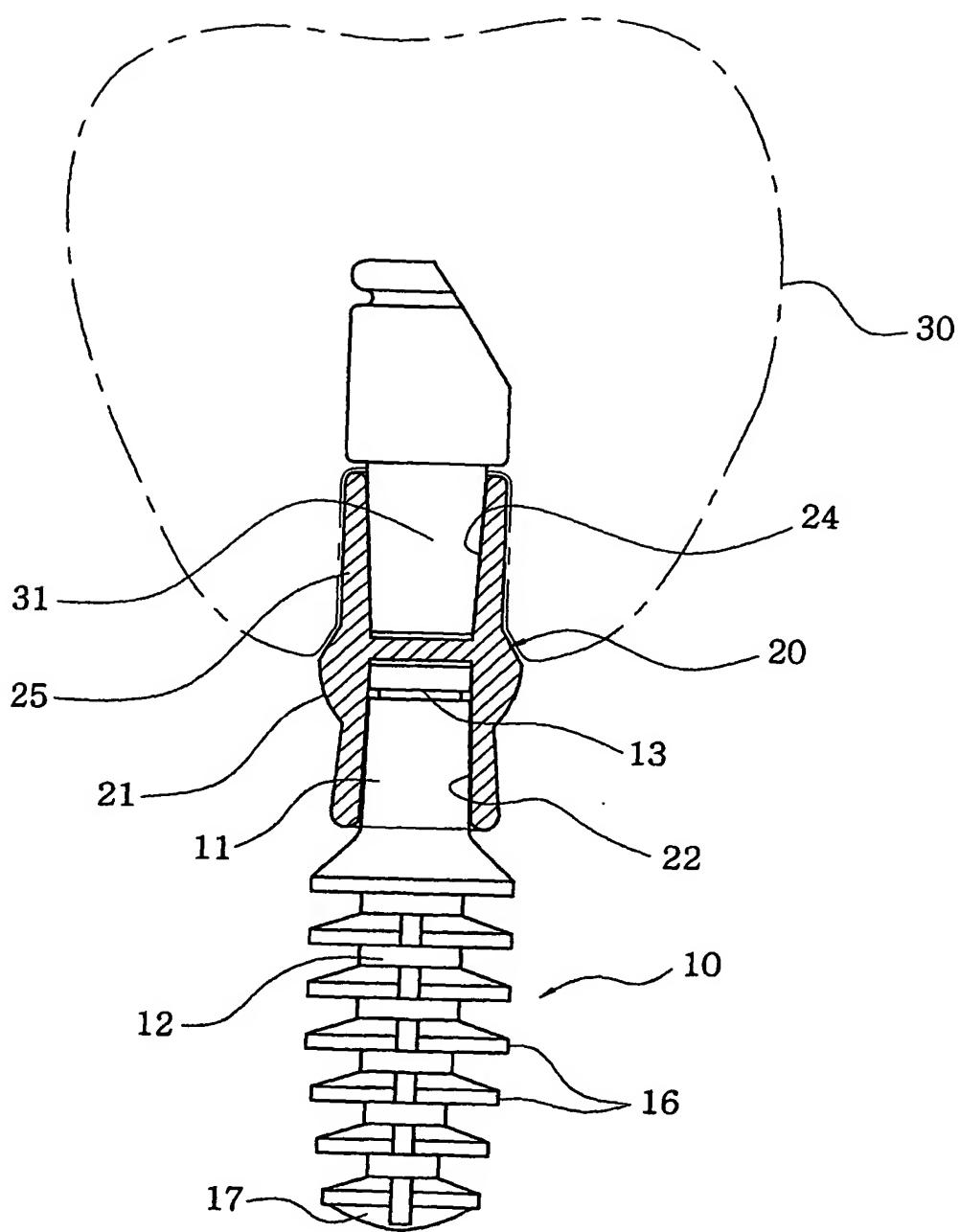
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FIG. 3



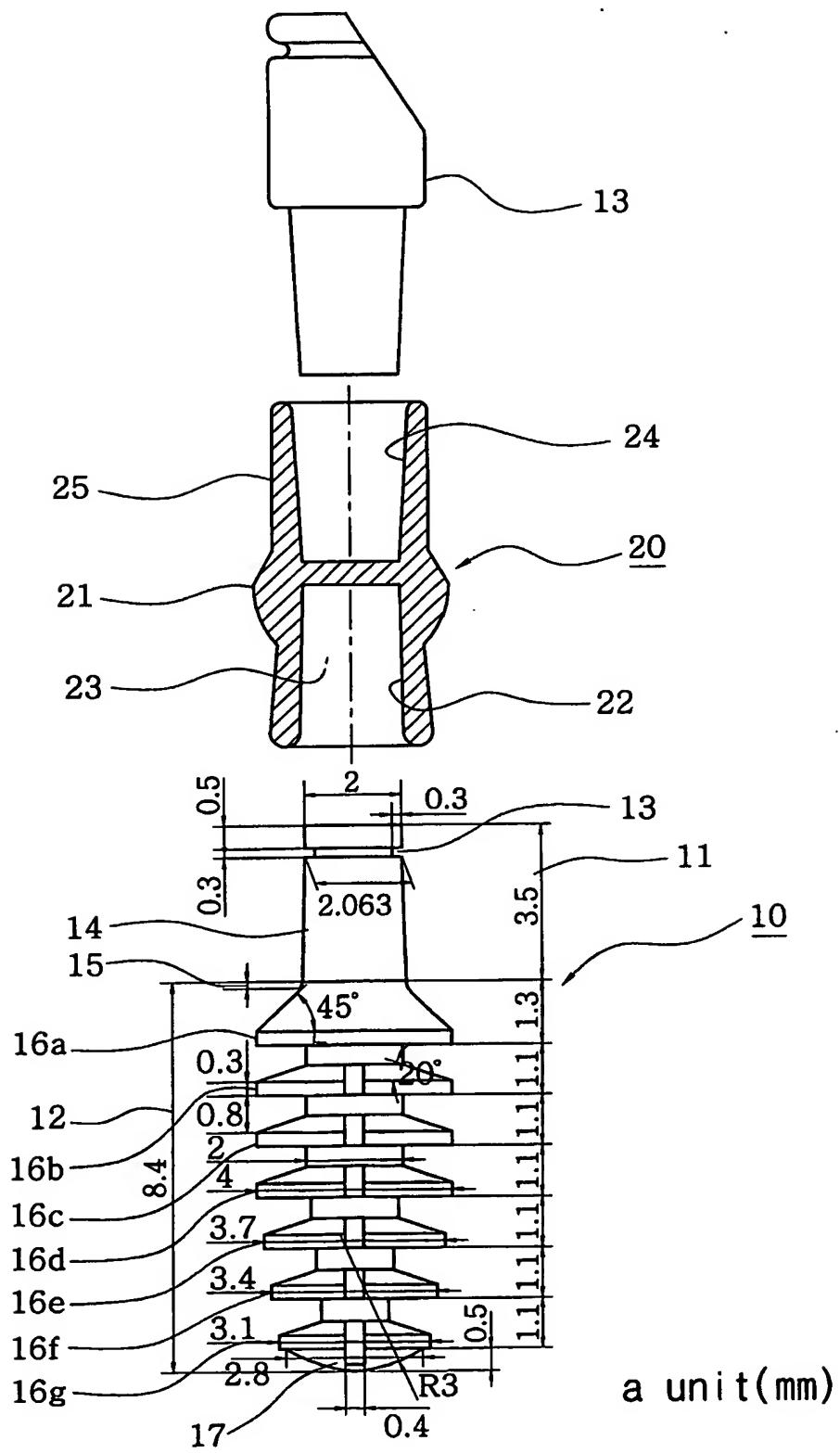
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FIG. 4



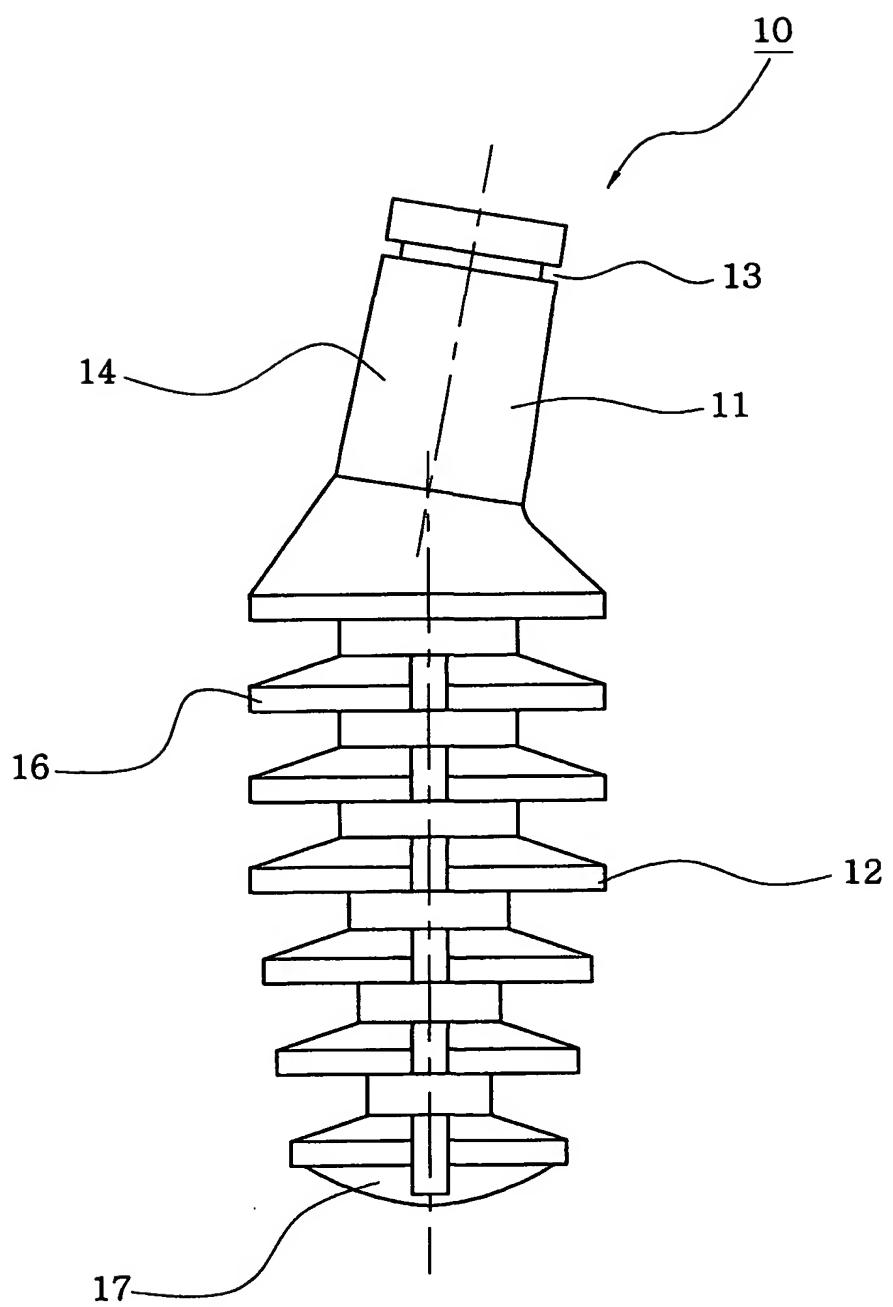
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FIG. 5



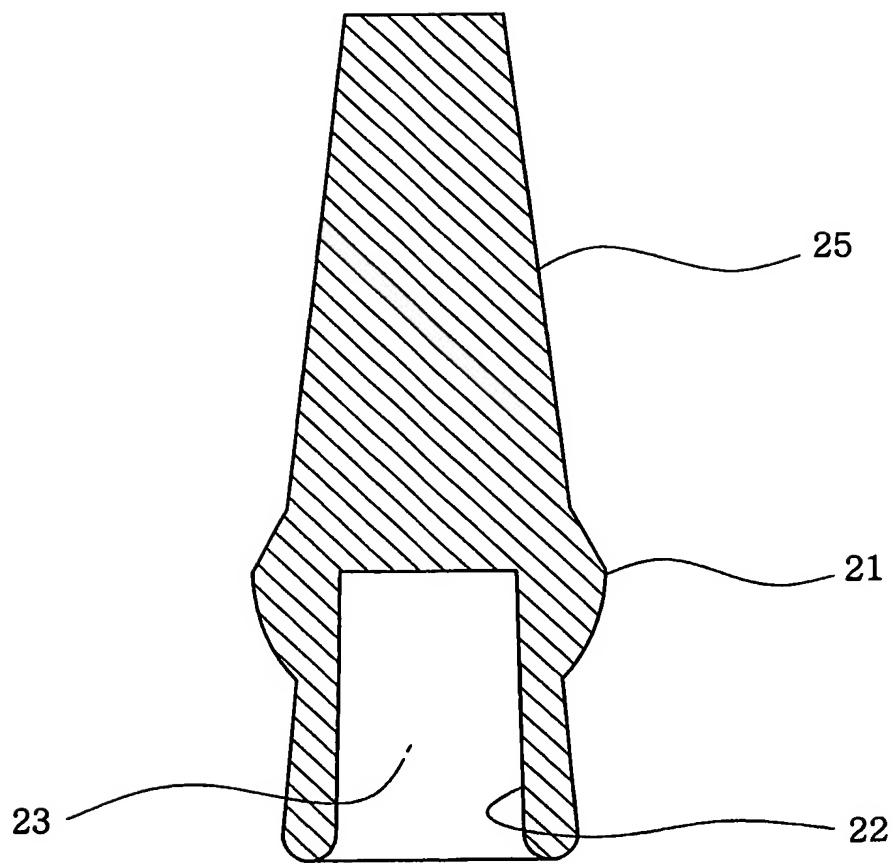
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FIG. 6



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FIG. 7



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR03/00068

**A. CLASSIFICATION OF SUBJECT MATTER****IPC7 A61C 8/00**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC7 A61C 8/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Patents and Applications for inventions since 1975

Korean Utility models and Applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NPS, PAJ, FPD, USP

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4486178 A (Friedrichsfeld GmbH Steinzeug-und Kunststoffwerke) 04 December 1984 see fig.1-2, column 3 line 13 - line 28, claims 1-3	1, 2, 4, 5
A	US 5007835 A (Maurice Valen) 16 April 1991 see fig.4, column 3 line 53 - line 68	1, 3
A	US 5312255 A (Ernst Bauer) 17 May 1994 see fig.2, column 4 line 9 - line 14	3
A	JP 54-156389 A (Kyoto Ceramic Co., Ltd) 10 December 1979 see the whole document	1

 Further documents are listed in the continuation of Box C. See patent family annex.

## \* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

23 APRIL 2003 (23.04.2003)

Date of mailing of the international search report

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

PCT/KR03/00068

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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JP 54-156389 A	10.12.1979	NONE	